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Abstract
Previously, little information has been available about life expectancy and the probability of survival by socio-economic status or for Aboriginal groups. However, data from the 1991 to 2001 Canadian census mortality follow-up study made it possible to construct life tables for the non-institutional population aged 25 or older by a range of census variables. Those life tables have now been updated to include deaths through to the end of 2006. This report summarizes the updated findings. Life expectancy at age 25 and the probability of survival to age 75 tended to be low for people with low income and education, for residents of shelters, rooming houses and hotels, and for Registered Indians, non-Status Indians and Métis. In general, socio-economic disparities in mortality were greater for men than for women.

Keywords
cohort studies, education, homeless persons, housing, income, life tables, North American Indians

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Although life expectancy in Canada is among the longest in the world,[1] it differs across population groups.[2-6] Until recently, estimates by socio-economic indicators and for Aboriginal peoples have generally not been available, because information about these characteristics is not recorded on death registrations. With data from the 1991 to 2001 census mortality follow-up study, which tracked mortality in a 15% sample of the population, it became possible to construct life tables for such groups. These life tables have been updated to include deaths through to the end of 2006 (see *The data*). This report summarizes the updated findings. The objectives are to calculate remaining life expectancy at age 25 and the probability of survival to age 75 during the 1991-to-2006 period by income adequacy, education and residence in shelters, rooming houses and hotels, and for Registered Indians, non-Status Indians and Métis.

Life expectancy at age 25

At age 25, remaining life expectancy for members of the 1991 to 2006 Canadian census mortality follow-up cohort overall was 52.6 years among men and 57.9 years among women (Table 1). However, estimates of life expectancy varied with income, education, housing, and Aboriginal ancestry.

Life expectancy was shorter for people in lower income adequacy quintiles. For men, remaining life expectancy at age 25 was 55.3 years among those in the highest income quintile, but 48.2 years among those in the lowest, a difference

Table 1
Remaining life expectancy at age 25, by sex, income adequacy quintile, education, housing and Aboriginal ancestry, non-institutional cohort members aged 25 or older, Canada, 1991 to 2006

	Men			Women		
		95% confidence interval			95% confidence interval	
	Years remaining	from	to	Years remaining	from	to
Total cohort	**52.6**	**52.5**	**52.6**	**57.9**	**57.9**	**57.9**
Income adequacy quintile						
1 (lowest)	48.2	48.1	48.3	55.0	54.9	55.1
2	51.4	51.3	51.5	57.4	57.3	57.5
3	52.9	52.8	53.0	58.5	58.4	58.6
4	53.9	53.8	54.0	59.2	59.1	59.4
5 (highest)	55.3	55.2	55.4	59.9	59.8	60.0
Education						
Less than secondary graduation	50.5	50.4	50.6	56.4	56.3	56.5
Secondary graduation	53.0	53.0	53.1	58.5	58.5	58.6
Postsecondary diploma	55.0	54.8	55.1	59.7	59.6	59.8
University degree	56.5	56.3	56.6	60.6	60.4	60.8
Resident of shelter/rooming house/hotel	41.8	41.2	42.4	49.7	48.7	50.7
Aboriginal ancestry						
Registered Indian	46.9	46.5	47.3	51.1	50.7	51.5
Non-Status Indian	48.1	46.8	49.3	53.3	51.9	54.8
Métis	48.5	47.7	49.4	52.5	51.6	53.4

Source: 1991 to 2006 Canadian census mortality and cancer follow-up study. CANSIM Table 109-5401.

Table 2
Probability of survival to age 75, by sex, income adequacy quintile, education, housing and Aboriginal ancestry, non-institutional cohort members aged 25 or older, Canada, 1991 to 2006

	Men			Women		
		95% confidence interval			95% confidence interval	
	%	from	to	%	from	to
Total cohort	**64.6**	**64.5**	**64.8**	**78.1**	**78.0**	**78.3**
Income adequacy quintile						
1 (lowest)	50.1	49.7	50.5	69.5	69.1	69.9
2	60.1	59.8	60.5	76.3	75.9	76.6
3	65.3	64.9	65.7	79.4	79.1	79.8
4	68.7	68.4	69.1	81.4	81.1	81.7
5 (highest)	72.8	72.4	73.1	83.4	83.1	83.8
Education						
Less than secondary graduation	58.6	58.4	58.9	74.2	73.9	74.4
Secondary graduation	66.3	66.0	66.6	79.8	79.5	80.1
Postsecondary diploma	71.4	70.9	72.0	82.6	82.2	83.0
University degree	77.0	76.5	77.4	85.1	84.6	85.6
Resident of shelter/rooming house/hotel	30.7	29.2	32.2	56.2	53.2	59.2
Aboriginal ancestry						
Registered Indian	48.0	46.5	49.5	58.8	57.4	60.2
Non-Status Indian	49.9	45.0	54.7	61.3	56.1	66.6
Métis	54.2	51.1	57.2	60.6	57.3	63.9

Source: 1991 to 2006 Canadian census mortality and cancer follow-up study. CANSIM Table 109-5402.

of 7.1 years. Among women, the corresponding estimates were 59.9 years versus 55.0 years, a difference of 4.9 years.

As well, lower levels of education were associated with shorter life expectancy. For example, remaining life expectancy at age 25 was 56.5 years for men with a university degree, but 50.5 years for those with less than secondary graduation, a difference of 6.0 years. The figures for women were 60.6 and 56.4 years, a difference of 4.2 years.

Residents of shelters, rooming houses and hotels at time of the 1991 Census had a considerably shorter life expectancy than did other Canadians. For men in such accommodations, remaining life expectancy at age 25 was 41.8 years, or 10.8 years less than for the entire male cohort. For their female counterparts, remaining life expectancy at age 25 was 49.7 years, or about 8.2 years less than for the entire female cohort.

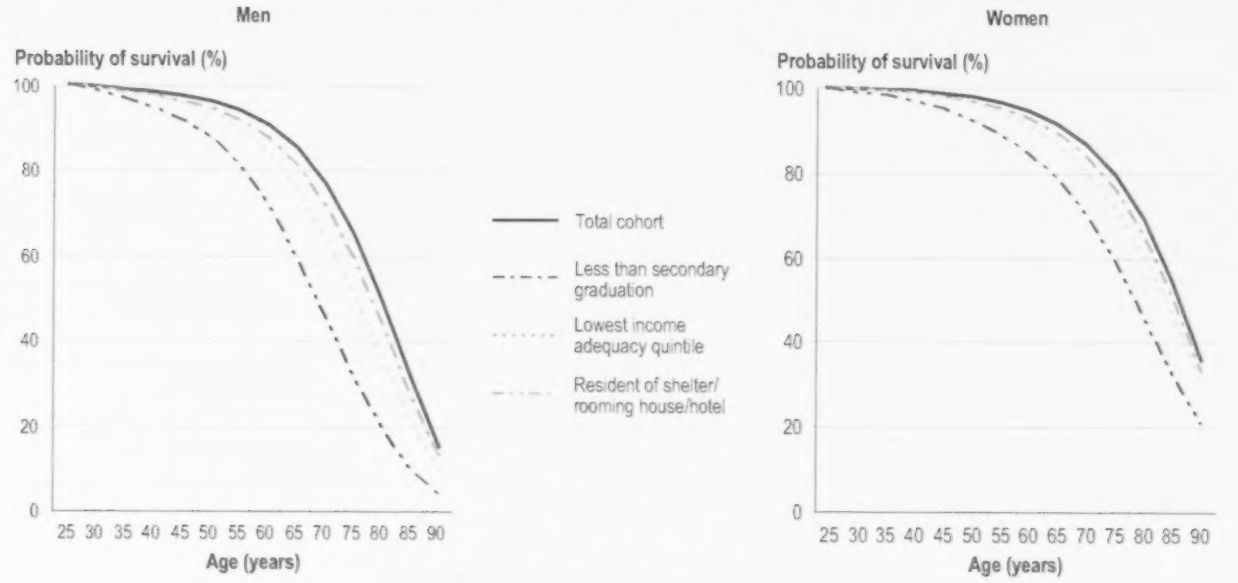
Life expectancy at age 25 was also shorter for cohort members reporting Aboriginal ancestry. Among men, remaining life expectancy at age 25 was 46.9 years for Registered Indians, 48.1 years for non-Status Indians, and 48.5 years for Métis—4.1 to 5.7 years less than for all men in the cohort. Among women, remaining life expectancy at age 25 was 51.1 years for Registered Indians, 53.3 years for non-Status Indians, and 52.5 years for Métis—4.6 to 6.8 years less than for all women in the cohort.

Probability of survival to age 75

In previous studies, death before age 75 has been considered premature.[7,8] Overall, 65% of male and 78% of female cohort members were expected to live to at least age 75 (Table 2).

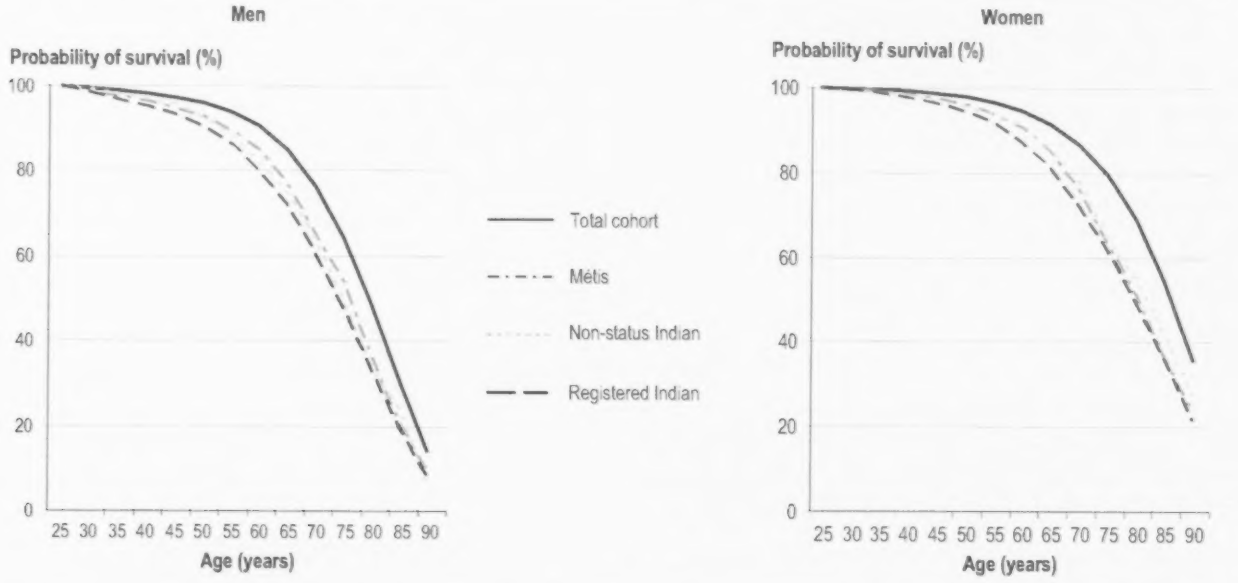
The probability of survival to age 75 varied by income adequacy quintile. Among men, the probability was 73% for those in the highest quintile and 50% for those in the lowest. The pattern was similar for women, although the gradient was not as steep: their probability of living to age 75 was 83% for those in the highest quintile, and 70% for those in the lowest.

Figure 1
Probability of survival for residents of shelters/rooming houses/hotels, people in lowest income adequacy quintile and people with less than secondary graduation, non-institutional cohort members aged 25 or older, Canada, 1991 to 2006



Note: The groups are not mutually exclusive; it is possible for the same individual to be a member of all groups.
Source: 1991 to 2006 Canadian census mortality and cancer follow-up study. CANSIM Table 109-5402.

Figure 2
Probability of survival, by sex and Aboriginal ancestry, non-institutional cohort members aged 25 or older, Canada, 1991 to 2006



Source: 1991 to 2006 Canadian census mortality and cancer follow-up study. CANSIM Table 109-5402.

The data

The 1991 to 2006 Canadian census mortality and cancer follow-up study tracked mortality in a 15% sample of the non-institutional adult population. People were eligible to be included in the study cohort if they were aged 25 or older and a usual resident of Canada on Census Day in 1991; were not a long-term resident of an institution; and were enumerated on the long-form questionnaire (Appendix table A).

Deaths of cohort members were determined by linking census records to the Canadian Mortality Database (4 June 1991 to 31 December 2006). Details about the construction and contents of the linked file have been reported elsewhere.[9,10]

Age was transformed from age at baseline to age at the beginning of each year of follow-up. Deaths and person-years at risk were calculated separately for each year (or partial year) of follow-up and then pooled by age at the beginning of each follow-up year. Abridged period life tables (based on 5-year age groups) for men and women, standard errors, and 95% confidence intervals were calculated according to the method of Chiang.[11] Remaining life expectancy is the average number of years a person at a given age would be expected to live if the mortality rates observed for a specific period persisted into the future.[12] Additional results for each population subgroup are available in CANSIM Tables 109-5401 and 109-5402.

Income adequacy quintiles were calculated by summing total pre-tax, post-transfer income from all sources for all family members, and then taking the ratio of total income to the Statistics Canada low-income cut-off for the applicable family size and community size group.[13] Quintiles were derived based on this ratio.[9]

Highest level of education was grouped into four categories: less than secondary graduation, secondary graduation or trades certificate, postsecondary certificate or diploma, and university degree or equivalent.

The category "shelters, rooming houses and hotels" comprises people whose usual residence at the time of census enumeration was one of the following types of non-institutional collective dwellings: shelters and hostels for the homeless, missions, YMCA/YWCA facilities, rooming and lodging houses, hotels, motels, and tourist homes.[14]

Registered Indian status was determined by a direct question: "Is this person a Registered Indian as defined by the Indian Act of Canada?" (yes, no). Non-Status Indians were defined as respondents who indicated a single ancestry of North American Indian, but were not a Registered Indian. Métis were defined as respondents who indicated a single ancestry of Métis, or who indicated two or more Aboriginal ancestries, one of which was Métis.

Undercoverage of the 1991 Census was estimated at 3.4%. These missed individuals were more likely to be young, mobile, low income, of Aboriginal ancestry,[15] or homeless. A total of 78 Indian reserves (about 38,000 people) were either not enumerated or incompletely enumerated and so were excluded from the census database and could not be part of the follow-up cohort.[16] People in long-term care facilities, seniors' residences or prisons, and non-tax-filers in the 1990 and 1991 tax years (data needed for linkage) were excluded from the cohort. As a result of these exclusions, at age 25 male cohort members had 4 months more of remaining life expectancy, and females cohort members had 6 months more, compared with the total population.[17,18]

Information about income, education, place of residence, and type of housing was collected only at baseline (1991 Census); these characteristics could have changed during the follow-up period.

The concept of ethnic or cultural ancestry (used to categorize persons as Métis or non-Status Indians) is fluid. It reflects individuals' understanding and views about their origins, awareness of their family background, and the social climate at the time of the census, all of which can influence the reporting of ethnic origin or ancestry, and all of which are subject to change. Thus, the results of this analysis may be affected by conditions that prevailed when the 1991 Census was conducted, and that may differ from more recent censuses.[19]

By level of education, degree-holders had the highest probability of living to age 75 (77% for men, 85% for women), whereas the lowest probability was for people who had not graduated from secondary school (59% for men, 74% for women). Differences were greater for men (18.4 percentage points) than for women (10.9 percentage points). The largest gap was between those who had and had not graduated from secondary school.

About a third (31%) of men residing in shelters, rooming houses and hotels at the time of the 1991 Census were expected to live to age 75—34 percentage points below the figure for all men in the cohort. Among women, 56% of those in shelters, rooming houses and hotels could expect to live to age 75—22 percentage points below the figure for all women in the cohort.

The probability of living to age 75 was also relatively low for Registered Indians, non-Status Indians and Métis. Among men, the probability was 48% for Registered Indians, 50% for non-Status Indians and 54% for Métis—10 to 17 percentage points lower than for the entire male cohort (Table 2). Among women, the probability of survival to age 75 was 59% for Registered Indians, and 61% for non-Status Indians and for Métis—17 to 19 percentage points lower than for the entire female cohort.

Survival curves for cohort members in the lowest income adequacy quintile were below the curves for people with less than secondary graduation (Figure 1). However, the survival curves for residents of shelters, rooming houses and hotels were far lower.

Among men, survival curves for Registered Indians, non-Status Indians and Métis were broadly similar, although each was below the curve for the entire male cohort (Figure 2). Among women, differences between the survival curves of the three Aboriginal groups were even smaller than for men, but the difference from the entire female cohort was larger.

Conclusion

Life tables for the 1991-to-2006 period, calculated by various indicators of socio-economic status and for Aboriginal groups, reveal considerable ranges in remaining life expectancy at age 25 and in the probability of survival to age 75.

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Appendix

Table A
Cohort members, person-years at risk, and deaths in follow-up period, by sex, income adequacy quintile, education, housing and Aboriginal ancestry, non-institutional population in Canada at baseline, 1991 to 2006

	Men			Women		
	Cohort members	Person-years at risk	Deaths	Cohort members	Person-years at risk	Deaths
Total cohort	**1,358,200**	**18,968,550**	**240,987**	**1,376,600**	**19,773,520**	**185,992**
Income adequacy quintile						
1 (lowest)	197,300	2,555,390	52,828	273,000	3,681,630	65,032
2	260,800	3,499,990	62,137	270,300	3,826,020	43,996
3	287,700	4,077,240	45,962	277,600	4,056,340	29,015
4	302,600	4,359,170	40,279	278,200	4,105,320	24,411
5 (highest)	309,900	4,476,770	39,781	277,500	4,104,200	23,538
Education						
Less than secondary graduation	474,900	6,249,140	138,071	478,500	6,563,790	110,472
Secondary graduation	510,400	7,318,980	69,084	484,000	7,096,100	47,128
Postsecondary diploma	168,300	2,457,660	15,493	253,000	3,734,390	19,960
University degree	204,600	2,942,760	18,339	161,100	2,379,250	8,432
Resident of shelter/rooming house/hotel	10,500	128,850	3,483	4,600	58,340	1,463
Aboriginal ancestry						
Registered Indian	24,900	347,730	4,037	32,400	468,990	3,832
Non-Status Indian	2,500	34,980	365	2,600	38,380	258
Métis	5,700	81,360	864	6,100	89,260	671

Source: 1991 to 2006 Canadian census mortality and cancer follow-up study